Acquired/Traumatic Brain Injury:
Recognizing the Source and Proper Steps to Take Following Acquired Head Impact and Chronic Symptomatology

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OBJECTIVES

1. Review the Types of Brain Injury
2. Identify the Prevalence and Effects of Brain Injury
3. Describe Treatment Approaches
TYPES OF BRAIN INJURY

**Acquired Brain Injury**

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<th>Non-Traumatic Brain Injury</th>
<th>Traumatic Brain Injury</th>
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<td>1. Penetrating</td>
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<td>4. Abuse</td>
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<td>5. Surgery</td>
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1. Anoxia
2. Infections
3. Strokes
4. Tremors
5. Metabolic Disorders
TYPES OF BRAIN INJURY

Acquired Brain Injury
• An injury to the brain that has occurred after birth and is not hereditary, congenital, or degenerative.
• The injury commonly results in a change in:
  • Neuronal activity
    • Which affects neurons in the following ways:
      • Physical integrity
      • Metabolic activity
      • Functional ability
• The term does not refer to brain injuries induced by birth trauma

TYPES OF BRAIN INJURY

Traumatic Brain Injury
• A TBI is an insult to the brain
• Not of a degenerative or congenital nature
• Caused by an external physical force
• That may produce a diminished or altered state of consciousness
• Results in an impairment of cognitive abilities and/or physical functioning.
• May also result in a disturbance of behavioral or emotional functioning
• These effects may be either temporary or permanent and cause partial or total functional disability
TYPES OF BRAIN INJURY

Traumatic Brain Injury
• Tumors
• Blood Clots
• Strokes
• Seizures
• Toxic Exposure (substance abuse, lead, inhalants, etc.)
• Infections (encephalitis, meningitis, etc.)
• Metabolic Disorders (insulin shock, diabetic coma, liver and kidney disease, etc.)
• Neurotoxic Poisoning (airway obstruction, strangulation, drowning, etc.)
• Lack of oxygen to the brain (anoxia)
TYPES OF BRAIN INJURY

Post-Concussion Syndrome

- It is estimated that 10% of individuals with a head injury will have persistent symptoms
  - Problems with:
    - Attention
    - Memory
    - Fatigue
    - Sleep
    - Headache
    - Dizziness
    - Irritability
    - Changes in Mood and Personality
TYPES OF BRAIN INJURY

Second Impact Syndrome
- Second Impact Syndrome (SIS) can occur when an individual sustains an initial head injury and then sustains a second injury before symptoms from the first have fully resolved
- May occur due to diffuse cerebral swelling or subdural hematoma
- The second injury could occur minutes, days, or weeks after the initial injury and can be:
  - Fatal
  - Result in Severe Disability
  - Long-term neurological, neuropsychological, and/or psychiatric consequences

TYPES OF BRAIN INJURY

Chronic Traumatic Encephalopathy (CTE)
- Repeated head injury
- Progressive degenerative disease
- Researchers have reported that symptoms appear to be similar to Alzheimer's Disease
- Other researchers indicate that CTS is a unique build-up of abnormal Tau Proteins and tangles in neurons
- Has been diagnosed after death in athletes with a history of multiple head injuries
- These effects could occur within months to years after the trauma
- Individuals with CTE may show symptoms of:
  - Dementia – memory loss
  - Aggression
  - Confusion
  - depression
PREVALENCE OF BRAIN INJURY

Incidence per 100,000
PREVALENCE OF BRAIN INJURY

• Traumatic Brain Injury is the leading cause of death and acquired disability in the US
• According to the CDC, the two age groups at greatest risk for TBI are children aged
  • 0-4
    • Falls
    • Abusive Head Trauma (Shaken Baby Syndrome)
  • 15-19
    • Concussions (sports)
    • Falls
    • Motor Vehicle Crashes

PREVALENCE OF BRAIN INJURY

• An estimated 10 million Americans are affected by ABI per year
• This makes brain injury the second most prevalent injury and disability in the United States
• Every 23 seconds one person in the U.S. sustains a TBI
• More than 50,000 people die every year as a result of TBI
• 235,000 people are hospitalized each year with TBI
• 80k-90k Americans experience the onset of a long-term disability following TBI each year
EFFECTS OF BRAIN INJURY

• A widely held belief is that children’s brains are resilient and the best time to have a brain injury is early in life

*HOWEVER*

• Young children are just as, if not more, vulnerable to the effects of brain injury than those that are injured later
• The prognosis for acquiring new skills is worse the younger the child is at the time of the brain injury
EFFECTS OF BRAIN INJURY

- The effects of a brain injury early in life may not be recognized until later in life due to the areas of the brain that are impacted not being used until later in life.
  - Less is expected of children early in life.
  - Therefore, the effects of their injury may not be recognized or misinterpreted.
  - Frontal lobe injury – executive functioning skills not being used until childhood/adolescence.
  - Children with early brain injuries may be mislabeled later in life as having other types of learning, behavior, or emotional challenges.

EFFECTS OF BRAIN INJURY

- Birth to 3 years:
  - Language acquisition
  - Refinements in sensory and motor systems
  - Regulation of sleep-wake patterns
  - Begin to understand cause-effect relationships
  - Emotionally egocentric
  - Symbiotic relationships with caregivers

- Behaviors after TBI:
  - Quick shifts from one emotion or state to another
  - Impulsivity
  - Use of primitive behaviors (biting, hitting, etc.)
  - Lack of self-awareness
  - Inability to self-regulate behaviors
  - Lack of responsiveness to others
EFFECTS OF BRAIN INJURY

• Pre-School (3 to 6 Years):
  • Very basic understanding of cause-and-effect relationships
  • Developing ability to think before acting
  • Focuses on one aspect of the situation at a time
  • Emotional focus is on control and mastery
  • Concrete and rigid thinking

• Behaviors after TBI:
  • Temper tantrums
  • High emotionality
  • Impulsivity
  • Primitive behaviors (biting, hitting, etc.)
  • Lack of concern for danger and safety
  • Resistance to influence or direction from parents

EFFECTS OF BRAIN INJURY

• Elementary (6 to 12 years):
  • Robust understanding of cause-and-effect relationships
  • Ready to learn academic skills
  • Focus on effort as important
  • Recognize intention of acts as important

• Developmental Disruptions Following Brain Injury (6 to 12 years):
  • Disruption in reading, spelling, math skills
  • Poor performance despite hard work
  • School failure/avoidance
  • Behavior problems during unstructured times
  • Depression, social isolation or withdrawal from peers
  • Sleep disturbance
  • Fatigue
EFFECTS OF BRAIN INJURY

Early Adolescence (12 to 16 years):
- Considers three or more dimensions simultaneously
- Abstract reasoning
- Increasing autonomy
- Beginning identity development
- Social stereotyping
- Responsibility: able to care for self, babysit, perform jobs for pay

Developmental Disruptions Following Brain Injury (12 to 16 years):
- Unevenness in cognitive profile
- New learning deficits
- Slower rate of processing
- Difficulty organizing complex tasks over time
- Judgment and reasoning difficulties
- Increased “frustration” response
- Depression and/or fatigue

Late Adolescence (16 to 19 years):
- Complex reasoning and judgment
- Ability to plan and execute complex projects over time
- Solid sense of own identity based on positive identifications
- Capacity for altruism

Developmental Disruptions Following Brain Injury (16 to 19 years):
- New learning deficits (e.g., memory for numbers)
- Mental processing speed deficits
- Inability to organize complex tasks
- Conflict between specific challenges and career goals
- Interference in developmental drive toward independence/separation
- Social awkwardness
- Fatigue and/or Depression
- Defensiveness regarding emotional/cognitive problems
- Body image/social image
TREATMENT APPROACHES

*THE HUMAN BRAIN PRODUCES NEW CONNECTIONS!!!!!*

• Until the 1970s it was commonly thought that the nervous system was essentially fixed.

• 1998 – Fred Gage & Peter Erikkson
  
  • Plasticity – the brain’s ability to rewire and alter brain tissue for the purpose of adapting to changes externally or internally\(^2\)
  
  • Structural plasticity – the change of physical structures by the brain due to environmental stimuli or injury
  
  • Functional plasticity – the brain’s ability to alter function from one area to another due to damage
Team Approach
- Primary Care
- Neuropsychology/Psychology
- Neuropsychiatry
- Rehabilitation Specialists
  - Physical Therapy
  - Occupational Therapy
  - Speech Therapy
- School
- Family

Medical Management
- Formal imaging (CT, MRI, etc.)
- Vestibular Disorders
- Neuropsychological testing to document symptoms
TREATMENT APPROACHES

Medical Management
- Cardiopulmonary system
  - Parts of the brain controlling heart may be affected by injury
- Respiratory System
  - Trauma to the larynx/trachea
- Musculoskeletal System
  - Spasticity
- Skin System
  - Lacerations, abrasions, pressure ulcers
- Gastrointestinal System
  - Increase in metabolism, poor coordination, dysphagia
- Neurological System
  - Headaches, seizures

TREATMENT APPROACHES

Neuropsychological Evaluations
- Assess
  - Attention
  - Memory
  - Executive Functioning
  - Language
  - Visual-spatial
  - Adaptive skills
- Suggest treatment planning based on neuropsychological pattern of strengths and weaknesses
Psychiatric Management

Psychiatric Manifestations may occur after Brain Injury and include:

- Major depression
- Anxiety
- Bipolar disorder
- Psychoses (Schizophrenia – like symptomatology)
- Anxiety disorders – panic attacks, phobias, OCD

Therapies

- Physical Therapy
- Occupational Therapy
- Cognitive Therapy
- Speech Therapy
- Psychotherapy/Family Therapy
TREATMENT APPROACHES

School Accommodations
Individualized Education Plan (IEP) or 504 Plan
Based on a child’s physical and cognitive needs
- Motor Impairments
- Physical effects
- Feeding disorders
- Sensory impairments
- Communication impairments

TREATMENT APPROACHES

School Accommodations
- Fatigue
- Medical issues
- Social/emotional or behavioral difficulties
- Family difficulties
- Post-school or vocational issues
TREATMENT APPROACHES

School Accommodations
Cognitive/Learning Challenges
  • Attention
  • Memory
  • Executive functioning
  • Processing speed
  • Splinter skills

TREATMENT APPROACHES

School Accommodations
Attention and concentration
  • Provide clear learning objectives
  • Provide short, concise instructions
  • Shorten assignments; divide work into smaller sections
  • Provide nonverbal attention cues
  • Provide breaks
  • Reward on-task behavior
TREATMENT APPROACHES

School Accommodations

Memory and learning problems

• Provide learning objective for each lesson
• Link newe information to relevant prior knowledge
• Provide hands-on learning opportunities
• Frequently repeat and summarize information
• Use organizers (preferably in written format)
• Provide an extra set of books for home

School Accommodations

Organization

• Provide templates for assignments, projects, and papers
• Provide visual schedules
• Provide assistance with homework planners
• Backpack check
• Provide assignments and notes on school wesite
• Utilize different colored notebooks for each subject
• Break down long-term projects into parts with specific timelines
TREATMENT APPROACHES

School Accommodations

Following directions

- Provide oral and written instructions (bi-modal learning)
- Highlight written directions
- Task-analyze directions into simple steps

Auditory-perceptual

- Limit amount of information presented
- Speak more slowly to allow for assimilation of information
- Provide visuals with auditory information (bi-modal learning)
- Use a buddy system to help repeat instructions
TREATMENT APPROACHES

School Accommodations

Visual-perceptual
- Limit amount of information on one page
- Use large print
- Present materias on a slant
- Provide longer viewing times
- Offer seating close to the front
- Use arrows or cue words for orientation
- Provide maps or teach students to navigate new schedules

TREATMENT APPROACHES

School Accommodations

Motor-Physical
- Use of assistive technology and adapted devices to provide better access
- Allow extra time for tasks and changing classes
- Adapted physical education
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